Molecular basis of embryonic stem cell self-renewal: from signaling pathways to pluripotency network.

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Public Summary:
Embryonic stem cells (ESCs) can be maintained in culture indefinitely while retaining the capacity to generate any type of cell in the body, and therefore not only hold great promise for tissue repair and regeneration, but also provide a powerful tool for modeling human disease and understanding biological development. In order to fulfill the full potential of ESCs, it is critical to understand how ESC fate, whether to self-renew or to differentiate into specialized cells, is regulated. On the molecular level, ESC fate is controlled by the intracellular transcriptional regulatory networks that respond to various extrinsic signaling stimuli. In this review, we discuss and compare important signaling pathways in the self-renewal and differentiation of mouse, rat, and human ESCs with an emphasis on how these pathways integrate into ESC-specific transcription circuitries. This will be beneficial for understanding the common and conserved mechanisms that govern self-renewal, and for developing novel culture conditions that support ESC derivation and maintenance.

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